



Your solar partner worldwide

Industrial Adhesives, Sealants and Cleaners

Henkel offers the world's most extensive portfolio of adhesives, sealants and surface treatments for industrial applications worldwide.



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Solutions for the Photovoltaic Industry Adhesives, Sealants and Cleaners





HENKEL PRODUCTS AND SERVICES ALONG THE PHOTOVOLTAIC VALUE CHAIN

Henkel is your strong partner for photovoltaic solutions

One source for all your needs

Developing efficient solutions for the photovoltaic industry requires a 360-degree approach. Henkel's high quality tailor-made adhesives, sealants and cleaners improve quality, enable highly automated production processes, increase production speed, and thus decrease your manufacturing cost. The innovative Henkel solutions have an excellent reputation worldwide.

Quality with brands and technologies

Solar power will be a key source of energy in the future. As a system provider, Henkel is playing a major role in the breakthrough of this innovative technology – with high-tech adhesives, sealants and cleaners.

Solutions from Henkel fulfill the technical requirements and comply with the relevant standards of the photovoltaic industry (e.g., IEC 61215/61646/61730, UL 1703, Safety Class II). Henkel experts have in-depth knowledge of our customers' needs.

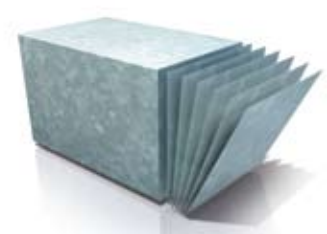
Our competencies

- Development experience
- Technology and application know-how
- Environmentally compatible solutions
- Comprehensive system of products and services
- Cooperation with machine manufacturers
- Global team, global presence – local support

Your benefits at a glance

- Improve your process and product quality through:
 - fast, highly automated processes
 - more durable products
- Reduce your overall costs
- Profit from various approvals
- Benefit from ongoing product development
- Gain a long-term partner

Silicon Wafers



Cleaning page 4

Wastewater Treatment page 4

Cells/ Modules



Concentrator page 5

Crystalline page 6

Thin-Film page 8

Flexible page 11

Building Integrated Photovoltaic



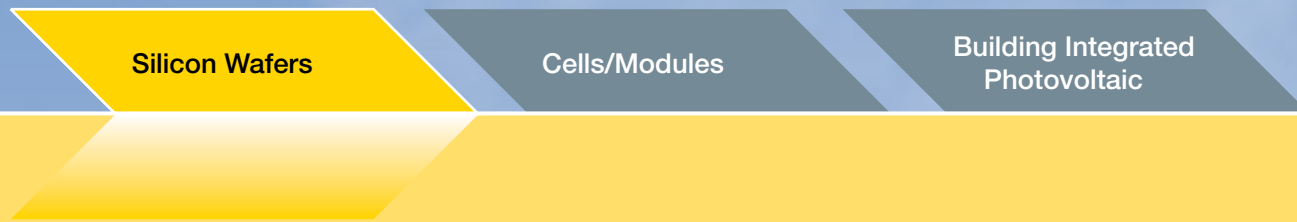
Lamination page 12

Electrical Insulation page 13

Photovoltaic and more ...

Electrical Devices page 14

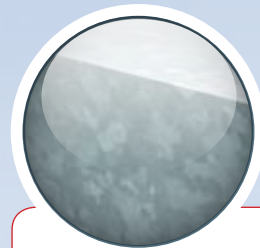
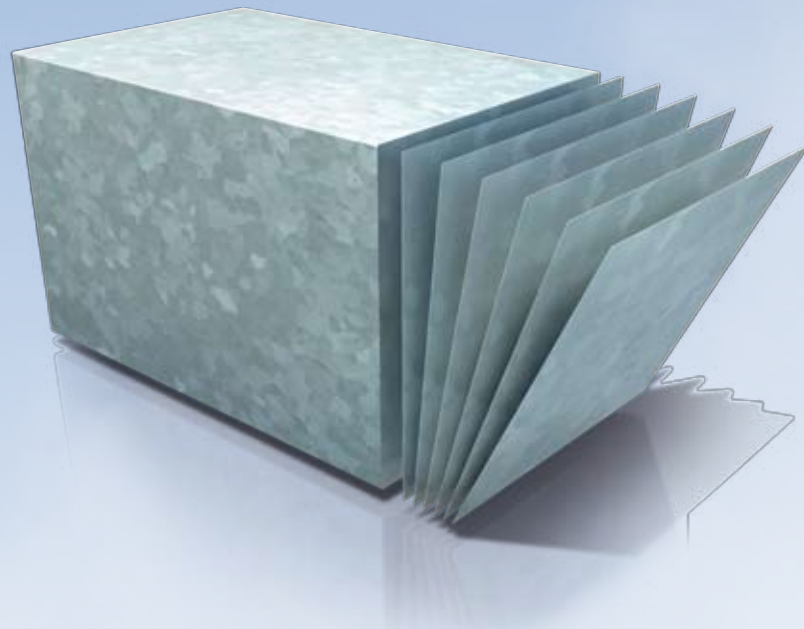
Backsheet Lamination page 15



SILICON WAFER PRODUCTION

Environmental responsibility and perfect cleaning results – The key requirements for our products

Cleaning of solar wafers
P3 product range – decades of cleaning expertise



Pre-cleaning

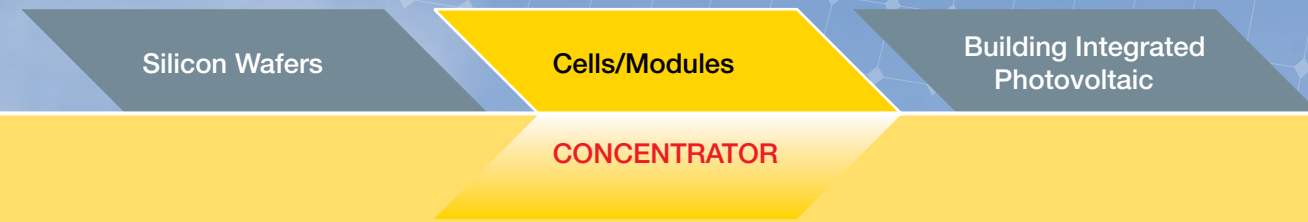
- Main residues from silicon block cutting are removed
- Benefit from lubrication properties to facilitate wafer separation
- Adaptable products with different lubrication properties, depending on the intermediate storage time

Main cleaning

- Cleaning of wafers to remove all silicon scraps, acid and bonding residues
- Clean surfaces without disturbing substances for the texturizing
- Our products suit your process: ultrasonic baths or horizontal lines with sprays

Henkel know-how – Wastewater treatment expertise

- Support for compliance with wastewater regulations
- Recommendation for installations and products in use
- Consulting regarding the prolongation of bath lifetime
- Close collaboration with water treatment companies



CONCENTRATOR MODULE ASSEMBLY

Unique solutions for an emerging market

Bonding of Concentrator Solar Cells

Emerson & Cuming, Loctite, Multicore, Hysol – leading edge products for the fast moving electrical industry

- Electrically and thermally conductive die attach adhesives
- Lead-free solder alloys
- Fast cure, low-temperature cure adhesive for lens-fixation
- Thermally conductive adhesive pastes, films, pads and phase change materials for heat dissipation
- Low-stress, transparent encapsulants
- 1-component pre-mixed materials, ready to use or 2-component systems
- Low-temperature cure (from 70°C) enables use of temperature sensitive substrates
- Very fast cure possible (from 100°C) for high volume, high throughput, automated production processes

High Performance Sealing and Elastic Bonding

Terostat MS, Terostat Butyls and Loctite Silicones

- Outstanding resistance to mechanical loads and high wind loads (Terostat MS)
- Excellent long-term resistance to hard weathering conditions
- Highly automated processes and high production speed



Silicon Wafers

Cells/Modules

Building Integrated Photovoltaic

CRYSTALLINE

CRYSTALLINE MODULE PRODUCTION

New dimensions in photovoltaic module manufacturing



Module Framing and Module Mounting

Terostat MS – high performance elastic bonding

- Outstanding resistance to mechanical loads and high wind loads
- Excellent long-term resistance to hard weathering conditions
- Highly automated processes and high production speed
- Excellent primerless adhesion to glass, metal and plastics
- No hazard labeling
- IEC 61215/61730 approved
- RoHS compliant

Module framing – Terostat MS with higher flexibility

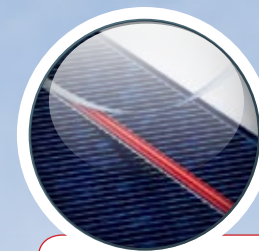
Module mounting – Terostat MS with higher bond strength



Junction Box Potting

Self-leveling Henkel casting resins according to your specific requirements

- 2-component silicones
- 2-component epoxies
- 2-component polyurethanes
- UV-curable resins



Electrically Conductive Bonding

Multicore and Emerson & Cuming – recognized by the electrical industry

- Electrically conductive adhesives
- Lead-free solder alloys
- Fluxing agents
- RoHS compliant
- Long-term performance and durability
- Very flexible, fast curing for interconnection of thinner silicon solar cells



Junction Box Bonding

Purmelt ME – the new PUR hotmelt alternative

- Instant high initial tack and handling strength after seconds
- Highly automated processes and very high production speed
- Broad adhesion spectrum (Tedlar®, glass, plastics, etc.)
- Excellent bonding strength
- Excellent long-term resistance to hard weathering conditions
- Safe handling, no hazard labeling
- IEC 61215 compliant

Terostat MS – high performance elastic bonding

- Excellent long-term resistance to hard weathering conditions
- Highly automated processes
- Excellent primerless adhesion to glass, metal and plastics
- No hazard labeling
- IEC 61215/61730 approved
- RoHS compliant



For details of backsheet lamination, please see page 15.

Silicon Wafers

Cells/Modules

Building Integrated Photovoltaic

THIN-FILM

THIN-FILM MODULE PRODUCTION

Outstanding reliable products and comprehensive know-how



Module Framing

Terostat Butyls – the water-vapor-tight solution

- Initial handling strength right after application
- Highly automated processes and very high production speed
- Excellent long-term resistance to hard weathering conditions
- Excellent primerless adhesion to glass, metal and plastics
- Safe handling, no hazard labeling
- IEC 61646 approved
- RoHS compliant



Junction Box Potting

Self-leveling Henkel casting resins according to your specific requirements

- Butyls (water-vapor-tight)
- 2-component silicones
- 2-component epoxies
- 2-component polyurethanes
- UV-curable resins



Electrically Conductive Bonding

Emerson & Cuming – the photovoltaic thinfilm reference

- Long-term reliable, stable electrical contact, even on different non-noble metal substrates
- 1-component pre-mixed materials, ready to use
- Low temperature cure (from 70°C) allows the use of temperature sensitive substrates
- Very fast bonding process enabling high volume, high throughput production processes



MicroEmission

Junction Box Bonding

Purmelt ME – the new PUR Hotmelt alternative

- Instant high initial tack and handling strength after seconds
- Highly automated processes and very high production speed
- Broad adhesion spectrum
- Excellent bonding strength
- Excellent long-term resistance to hard weathering conditions
- Safe handling, no hazard labeling
- IEC 61215 compliant

Terostat MS – the traditional high performance elastic bonding

- Excellent long-term resistance to hard weathering conditions
- Highly automated processes
- Excellent primerless adhesion to glass, metal and plastics
- No hazard labeling
- IEC 61646 approved
- RoHS compliant

Silicon Wafers

Cells/Modules

Building Integrated Photovoltaic

THIN-FILM

Silicon Wafers

Cells/Modules

Building Integrated Photovoltaic

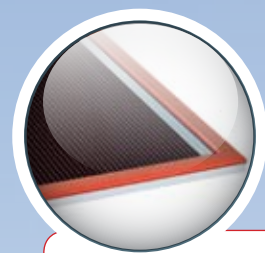
FLEXIBLE

THIN-FILM MODULE PRODUCTION – FRAMELESS

FLEXIBLE MODULE PRODUCTION

Outstanding reliable products and comprehensive know-how

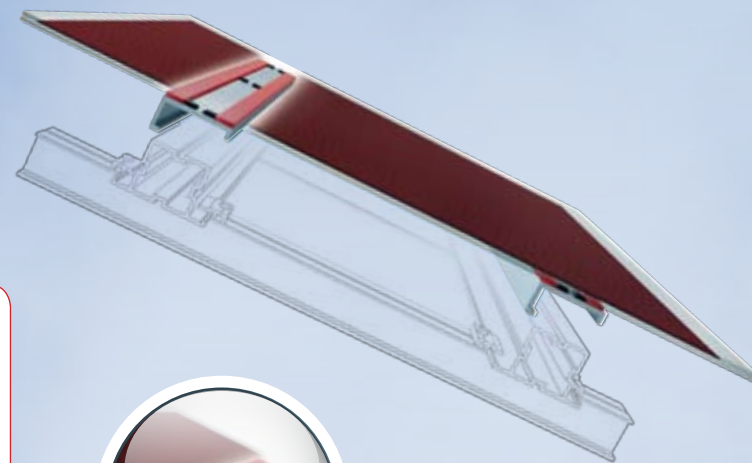
Best-in-class reliability testing performance for electrically conductive adhesives and inks



Frameless Sealing

Terostat Butyls – the water-vapor-tight solution

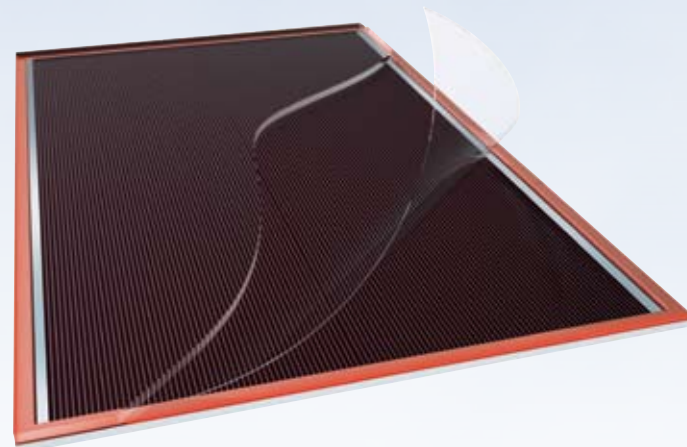
- Incorporated adhesion promoter provides excellent adhesion to glass
- Fully automatic nozzle application from bulk
- Resistant to laminating temperature of 150°C
- No waste of release paper
- Black color
- IEC 61646 compliant
- RoHS compliant



Module Mounting

Terostat MS – high performance elastic bonding

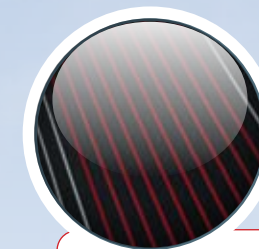
- Outstanding resistance to mechanical loads and high wind loads
- Excellent long-term resistance to hard weathering conditions
- Highly automated processes and very high production speed
- Excellent primerless adhesion to glass, metal and plastics
- No hazard labeling
- IEC 61646 approved
- RoHS compliant



Metal Tab Bonding

Emerson & Cuming – electrically conductive adhesives

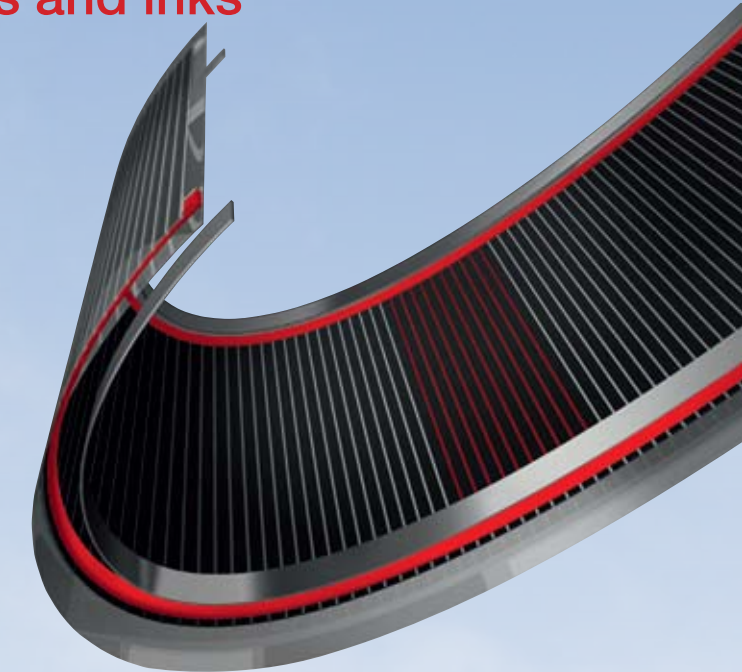
- Stable electrical contact on different substrates and reliable electrical connection
- Very good peel strength
- Nickel-filled for applications where silver migration is a concern
- 1-component materials premixed, ready to use
- Low-temperature cure (from 70°C) and use of temperature sensitive substrates
- Very fast cure possible (from 100°C) and high throughput production processes



Grid Metallization

Emerson & Cuming – electrically conductive inks

- Very flexible, fast drying electrically conductive, printable ink
- Unique low sheet resistance, suitable for flexible solar modules
- Long screen residence time
- Printable and excellent adhesion on various conductive transparent oxides, such as ITO, AZO



Silicon Wafers

Cells/Modules

Building Integrated Photovoltaic

LAMINATION

Silicon Wafers

Cells/Modules

Building Integrated Photovoltaic

ELECTRICAL INSULATION

BUILDING INTEGRATED PHOTOVOLTAIC WITH FLEXIBLE MODULES

Reliable lamination on flexible roofing membranes or rigid metal/plastic panels



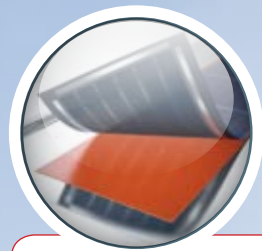
Laminating on Flexible Roofing Membranes

Purmelt and Macromelt – hotmelt solutions for fully continuous roll-to-roll manufacturing

- Instant high tack
- Excellent adhesion to many plastics
- High bond strength
- Highly weathering and temperature resistant
- No creep at elevated temperatures
- IEC 61646 approved

Purmelt: The PUR hotmelt for flat lamination of the flexible modules

Macromelt: The highly UV-resistant, black polyamide for edge sealing



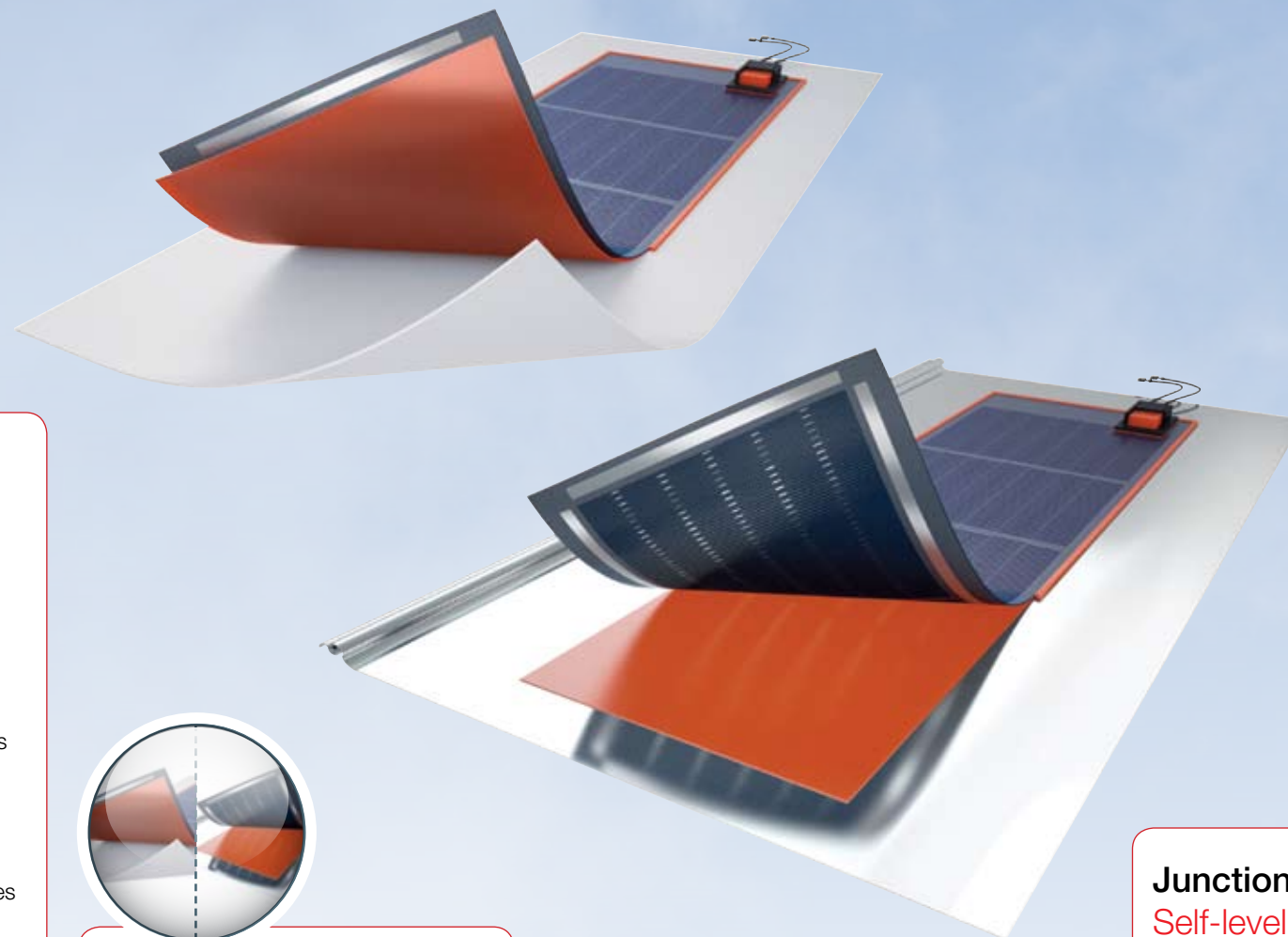
Laminating on Plastic or Metal Panel

Terostat MS – the brand new high-performance solution for fully automated processes

- Excellent adhesion to many plastics and to metal
- High bond strength
- Highly weathering and temperature resistant
- Little creep at elevated temperatures
- Very elastic and durable bond line
- IEC 61215 approved in several applications

2-component Terostat MS: Together with our OEM partners, Henkel has developed a new application technology for flat lamination with 2-component Terostat MS products

1- or 2-component Terostat MS: The ideal UV-resistant edge seal



Self Adhesive Tape

Terostat Butyls – the fast and easy solution

- Excellent adhesion to nearly any substrate
- Instant tack
- Instead of tape, also applicable from drum



Protection of Electronics against Weather and UV Radiation

Macromelt Molding – the innovative process solution

- Extremely short cycle time compared to traditional 2-component casting
- Makes the application of plastic housing redundant due to its plastic-like attributes
- Process approved and clean in handling
- Service temperature range from -40°C to 130°C
- Protects devices effectively against environmental influences
- IEC 61646 approved

Junction Box Potting

Self-leveling Henkel casting resins according to your specific requirements

- 2-component silicones
- 2-component epoxies
- 2-component polyurethanes
- UV curable resins

Junction Box Bonding and Scratch Repair on ETFE surfaces

Loctite 770/401 and 406 – the ultra-fast super glue

- Instant bonding strength
- Excellent adhesion to ETFE
- Damp, heat and UV-resistant

ELECTRICAL DEVICES

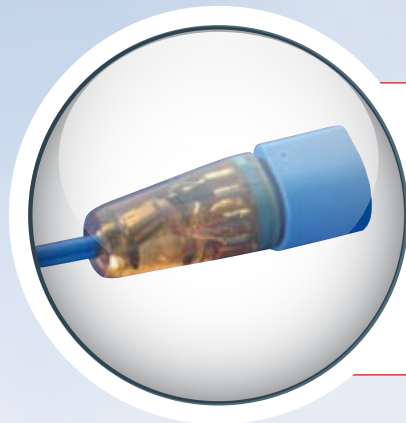
Electronics protection for outdoor applications under extreme conditions



Macromelt Molding

Grommet and junction

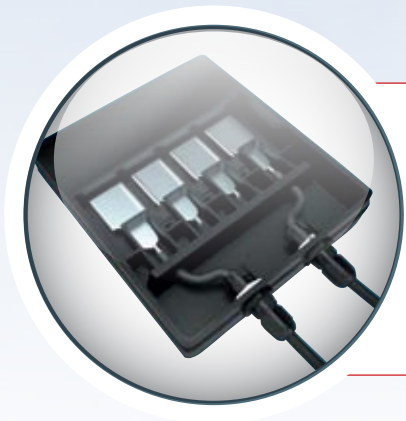
- Molding of cable junction
- Pre-assembling of the cable with simultaneous sealing and strain relief



Macromelt Molding

Connectors

- Molding of connectors
- Sealing of contact area
- Strain relief of cables



Terostat MS

Junction box assembly

- Fixing of electrical parts
- Bonding of housing and cover

BACKSHEET LAMINATION

High performance adhesives for reel-to-reel lamination processes

Backsheet laminates made with Liofol adhesive

Technical-grade laminates made with high-performance solvent-based Liofol adhesives have long ranked as tried-and-tested solutions.



Liofol 2-component solvent based PU adhesives

- Resistance to temperature, hydrolysis and UV (no yellowing)
- Best performance during vacuum lamination
- Easy application and process reliability

The adhesives are used for the manufacturing of backsheets consisting of various technical polymer films with weather-proof, mechanical, electrical or chemical characteristics:

- Polyvinyl fluoride (PVF) Tedlar® *
- Polyethylene terephthalate (PET)
- Special PET films
- Polyvinylidene fluoride (PVDF)
- Aluminum

The performance of the adhesive is matched to the performance of the films used.

4-MORE VALUE PACKAGE

Developing efficient solutions for bonding, sealing and surface treatments requires a 360-degree approach. Our specialists combine all four key “elements of value” into a comprehensive package to guarantee your success. You benefit not only from innovative **products**, but also from techniques to optimize **processes**, from professional **services** and support, and from powerful solutions for new **design** options.



Benefit from our outstanding products and technologies

- With our product range, we cover the entire photovoltaic process chain
- Our specialists continuously strive to improve existing solutions in line with market needs
- We keep pace with the rapid development of the solar market
- You benefit from our innovative, high-quality products, designed to provide solutions for tomorrow



New design needs competent partners

- Close cooperation with the equipment manufacturers of processing systems for adhesives, sealants and cleaners
- Advice in choosing the suitable application equipment for the recommended Henkel product
- Design of the production line together with the equipment manufacturer
- Dedication to the principles of sustainability and environmental protection
- Highest standards for product safety and health protection



Developing/introducing innovative processes and substrates

- Our excellently equipped Henkel technology centers support you in optimizing your processes
- Focus on reducing your production costs and improving product quality
- Development of solutions for new materials, including the appropriate application and performance tests



Worldwide comprehensive services from the Henkel experts

Technical Support and Trainings

- Technical support during production start-up through on-site assistance from Henkel experts
- Support by experienced specialists in adapting your production process to a new Henkel technology
- Customized technical training for your staff in one of our worldwide technology centers or on site at your production line
- Optimization and fine-tuning of process parameters for the Henkel product

Testing and Analysis

- Tests with your materials for initial analysis, thus minimizing risks when introducing new applications or substrates
- Testing of adhesives and substrates in our in-house laboratories significantly accelerates your new developments, solutions and approvals
- Henkel's certified analytic department is able to detect causes of failure or other phenomena with the latest state-of-the-art analytical equipment

Quality Control

- Quality check according to official regulations
- Individually designed tests according to your needs
- Evaluation of potential process improvements

Maintenance, Repair and Overhaul

- We offer a wide range of adhesives, sealants, lubricants and cleaners for maintenance and repair
- Application solutions for bonding and sealing a variety of materials
- For detailed information, please order the latest issue of the “Loctite Maintenance Solution Guide”, LT-3722

NOTES

HENKEL – SUSTAINABLE SOLUTIONS

About us

Founded in 1876 in Germany by Fritz Henkel, the company is now represented in more than 125 countries. Henkel operates in three strategic business areas – laundry and home care, personal care, and adhesives, sealants and surface treatments. We hold an internationally leading position in environmental and consumer protection. This derives not least from Henkel's pronounced capability to innovate. Henkel is the world leader in adhesives, sealants

and surface treatments. With its exceptionally broad range of products and specific process know-how, Henkel offers unique business opportunities for industrial customers in almost all sectors. Our customers receive tailor-made system solutions, optimally adapted to their production and manufacturing processes. Production centers on all continents guarantee optimum supply and logistics in all regions of the world.

